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November 03, 2004

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APPLICATION NUMBER: *60/506,387*
FILING DATE: *September 26, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/31703*

Certified by

Jon W Dudas

Acting Under Secretary of Commerce
for Intellectual Property
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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

09/26/03 17414 U.S. PTO

Docket Number: P2037PRO

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(c).

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
J. Russell	Woodside	Crystal Lake, Illinois
Ryan F.	Washburn	Crystal Lake, Illinois

☐ *Additional inventors are being named on the separately numbered sheets attached hereto.*

TITLE OF THE INVENTION (280 characters max)

SYSTEM AND METHOD FOR FIRING BRICKS

09/26/03 15535 U.S. PTO 60/506387

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☒ Customer Number 08968

☒

Gardner Carton & Douglas LLP
191 N. Wacker Drive, Suite 3700
Chicago, Illinois 60606-1698 U.S.A.

ENCLOSED APPLICATION PARTS (check all that apply)

☒ Specification *Number of Pages:* 3
(including any claims and abstract)
☒ Drawings *Number of Sheets:* 23
☒ Application Data Sheet. See 37 CFR 1.76

☐ Power of Attorney
☐ Assignment
☐ CD(s), Number
☒ Other (specify) Filing Fee

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☐ Applicant claims small entity status. See 37 CFR 1.27.
☒ A check or money order is enclosed to cover the filing fee(s).
☐ The Commissioner is hereby authorized to charge filing fee(s) or credit any overpayment to Deposit Account Number 07-0181 . A duplicate copy of this communication is enclosed for that purpose.
☒ The Commissioner is hereby authorized to charge any deficiencies in filing fees to Deposit Account Number 07-0181. A duplicate copy of this communication is enclosed for that purpose.

FILING FEE AMOUNT: $160.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government:
☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

Vernon W. Francissen

Vernon W. Francissen, Reg. No. 41,762
One of the Attorneys for Applicant(s)
GARDNER CARTON & DOUGLAS LLP
191 N. Wacker Drive, Suite 3700
Chicago, Illinois 60606-1698
(312) 569-1000 telephone
(312) 569-3000 facsimile

Date: September 26, 2003

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this correspondence and the documents referred to as attached or enclosed therein are being deposited with the United States Postal Service on September 26, 2003, in an envelope as "EXPRESS MAIL POST OFFICE TO ADDRESSEE" service under 37 CFR 1.10, Mailing Label Number EF366672858US, addressed to: Mail Stop Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Carlos Coronado
Typed or Printed Name of Person Making Deposit

Signature of Person Making Deposit

CH02/22266672.1

EXPRESS MAILING CERTIFICATE
UNDER 37 CFR § 1.10

Date of Deposit: September 26, 2003

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I hereby certify that the attached correspondence, including any documents or materials referred to thereon as enclosures or attachments, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated above and is addressed to:

Mail Stop Provisional Patent Application
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Title: SYSTEM AND METHOD FOR FIRING BRICKS

Applicant(s): Woodside et al.

Application No.: Unassigned

Filing Date: September 26, 2003

Enclosed:

1. Provisional Application for Patent Cover Sheet (2 pgs) and duplicate thereof (2 pgs)
2. Application Data Sheet (3 pgs)
3. Provisional Patent Application comprising: Specification (3 pgs); Drawings (23 pgs)
4. Check in the amount of $160.00
5. Return postcard

Carlos Coronado
Typed or Printed Name

Signature

Attorney Docket No. **P2037PRO**
Client No. 013175-0027

CH02/22266677.1

SYSTEM AND METHOD FOR FIRING BRICKS

[0001] Brick are classified under NAICS "Brick and Structural Clay Tile". Most brick made in America are "face brick" used in combination with wooden frame or concrete block for building facings. There are also paving brick used for sidewalks, streets and driveways and structural tile, usually glazed, used in public buildings like schools for interior walls such as bathrooms and hallways. Some small percentage of brick in various sizes is used for structural walls.

[0002] Nearly all brick are fired in "tunnel kilns" which is a continuous firing process where the product is placed on "kiln cars" that carry it through the kiln during the firing process, entering the kiln in the unfired state and exiting fired.

[0003] Most tunnel kilns for brick manufacture have a refractory base on the kiln car upon which the brick are stacked. The most common currently used practice is to stack bricks on a solid deck 8 to 14 courses high and 3 brick long with a space for firing between these packs. This results in a pack that is approximately 30" to 40 " high by 26" deep. The width of the pack is typically 20 feet or more. The firing lane between packs is around 20 ". Burners fire in these lanes from either the top or the sides. For this type firing, the car is pushed incrementally aligning the firing lane with the burners after each "push" (Called "index pushing").

[0004] There is also a practice where brick are stacked on a raised deck and burners fire under and over the load. With this practice, when the brick are stacked 8 to 14 courses high, the firing cycle is similar to index firing concept, typically 48 hours. All other things being equal, the higher the set the longer the cycle.

[0005] There has been some kilns built with "low set" or 2-high. With this type setting it has been demonstrated that the firing cycle is shortened dramatically to as low as 4 hours, depending on the characteristics of the raw material. The overall economics of the low set approach do not appear to favor the process, as few manufacturer's are using it.

[0006] Nearly all new plants are built with systems for automatically stacking the bricks onto the kiln cars. Robots are now used for this, but the basic process has not changed in the last 35 years. Groups of brick are lifted and placed in the stack.

[0007] The process that we wish to patent is a system where bricks, stacked 2-high, are loaded onto a silicon carbide structure in multiple levels (we are targeting 4 levels). With this, unlike the conventional method, the levels are spaced such that the hot gases from the kiln heats the levels independently rather than heating through the tall stack. The faster rate of heating leads to faster firing cycles. Brick as formed (by an extrusion process) have 18% moisture that must be removed prior to firing. For the same reason, as with firing, the drying process can be accelerated. Faster cycles result in smaller kilns and dryers that have a significant impact on the capital outlay for constructing a new plant. Our approach offers better overall economics than the low-set approach because the firing cycles will be nearly the same and we will have 8 brick high (4 levels at 2) where low set has 2 brick high.

[0008] Our system for loading of the brick onto kiln cars has not been used for brick making. After the kiln car is precisely positioned in front of the machine, a carriage with rollers extends between the levels. In its final position, the carriage is lifted, raising the rollers between the ceramic beams to a level such that the top of the rolls are above the top of the beams. The entire level of brick (2-high by 8 wide by 7 long) are rolled into position over the beams by powering the rolls. In the final position, the rolls stop and the carriage lowers, placing the bricks onto the beams. Loading starts at the top level and repeats until all 4 levels are loaded. As each bay is loaded, the car is moved and the next bay loaded.

[0009] For unloading, the reverse process is used. Brick are unloaded from the bottom up.

[0010] Our process for building the cars involves anchoring the post securely in steel sockets in the kiln car frame using refractory concrete. The main beams are held by the posts and run lengthwise of the kiln car. The smaller beams, that hold the brick, rest on the main beams. Posts and main beams are made of silicon carbide. The cross beams may be of cordierite, mullite or silicon carbide.

[0011] During installation of the posts, the kiln car is held in position by a lug fastened to the kiln car frame. With this as the reference point, the posts are placed into a fixture, such that they are held in a predetermined way with respect to position, elevation, and are plumb. The fixture is lowered, putting the post into the sockets of the kiln car at the desired elevation. The refractory concrete ("castable") is applied and after it sets, the posts of all cars are in the same position with respect to the lug. The lug is used at the load and unload machines for positioning the cars, thus all kiln car posts and beams are the same for loading.

[0012] The car frame, in the area around the posts, is insulated with ceramic fiber. Most designs, excepting some of the low-set designs, do not use ceramic fiber as the load is supported on the refractory that rests on the kiln car. The ceramic fiber is much lower in density than the conventional refractory that must carry the load of brick in addition to insulating the frame. On each cycle less heat is required to heat the low mass ceramic fiber than is needed for heating the dense refractory, thus fuel savings occurs with the use of ceramic fiber.

[0013] In addition to lower capital cost, there are many other benefits to our system including lower fuel consumption and higher quality levels and lower losses.

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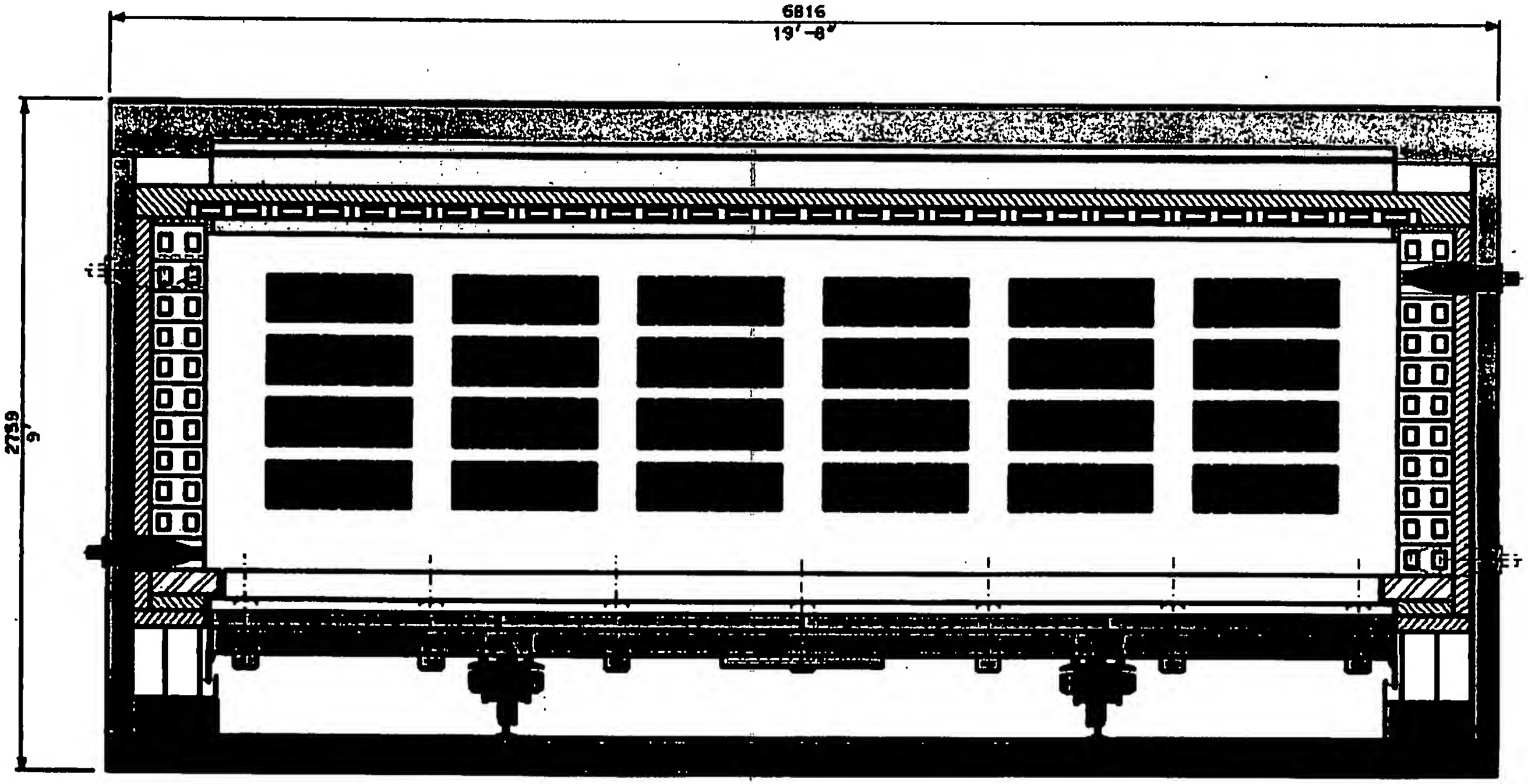
Ideal Brick Firing System



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Ideal Brick Firing System

Float Brick through the Kiln Atmosphere

Kiln Gases pass around the brick

Bricks are heated individually- not in packs

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Advantages of Ideal Firing System

- Faster Heating
  - Smaller Kiln
- Better Heat Exchange
  - Lower Fuel Consumption
- Better Temperature Uniformity
  - Size Control
  - Physical Properties
- No Pack Weight
  - Less breakage

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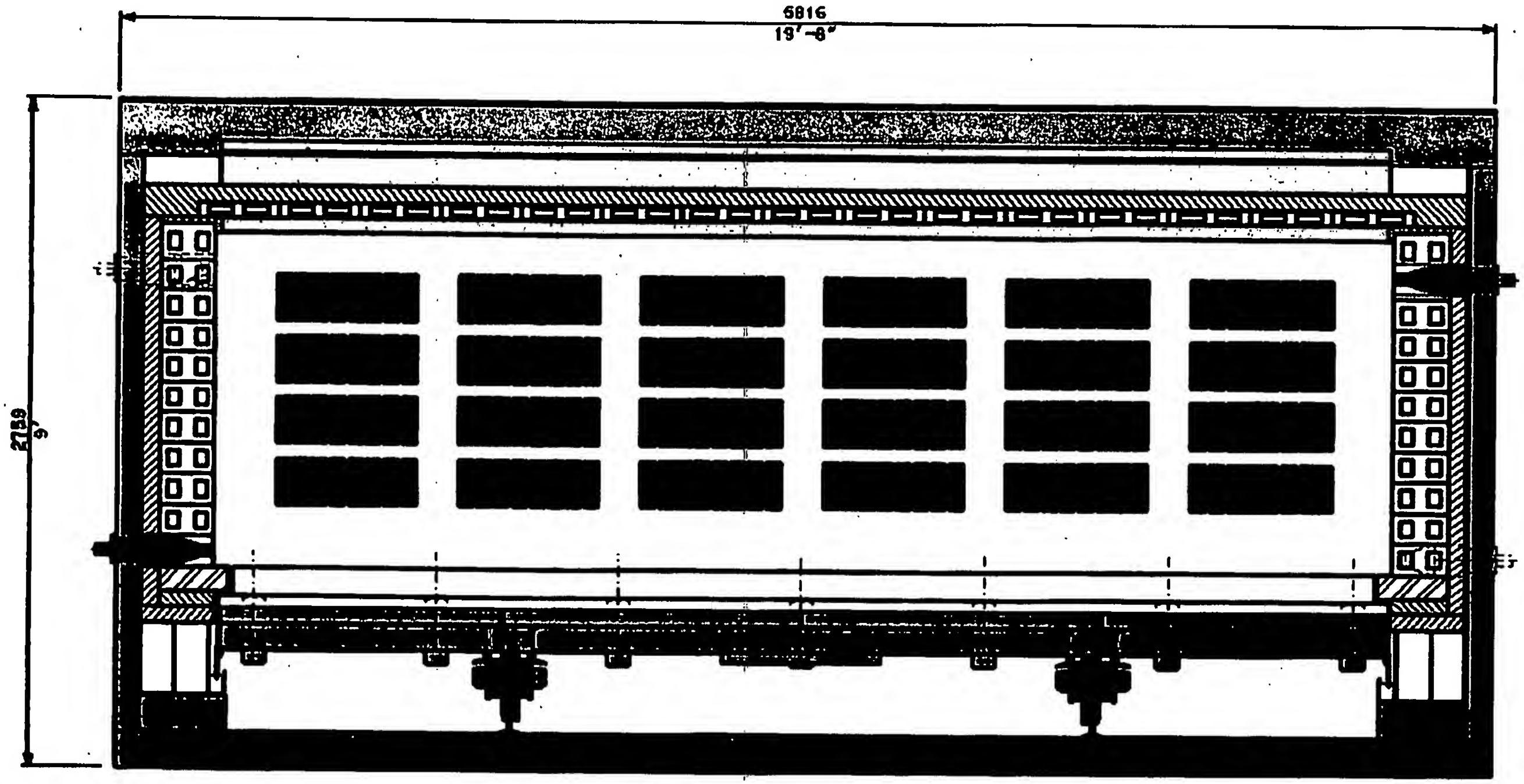
How to Do It



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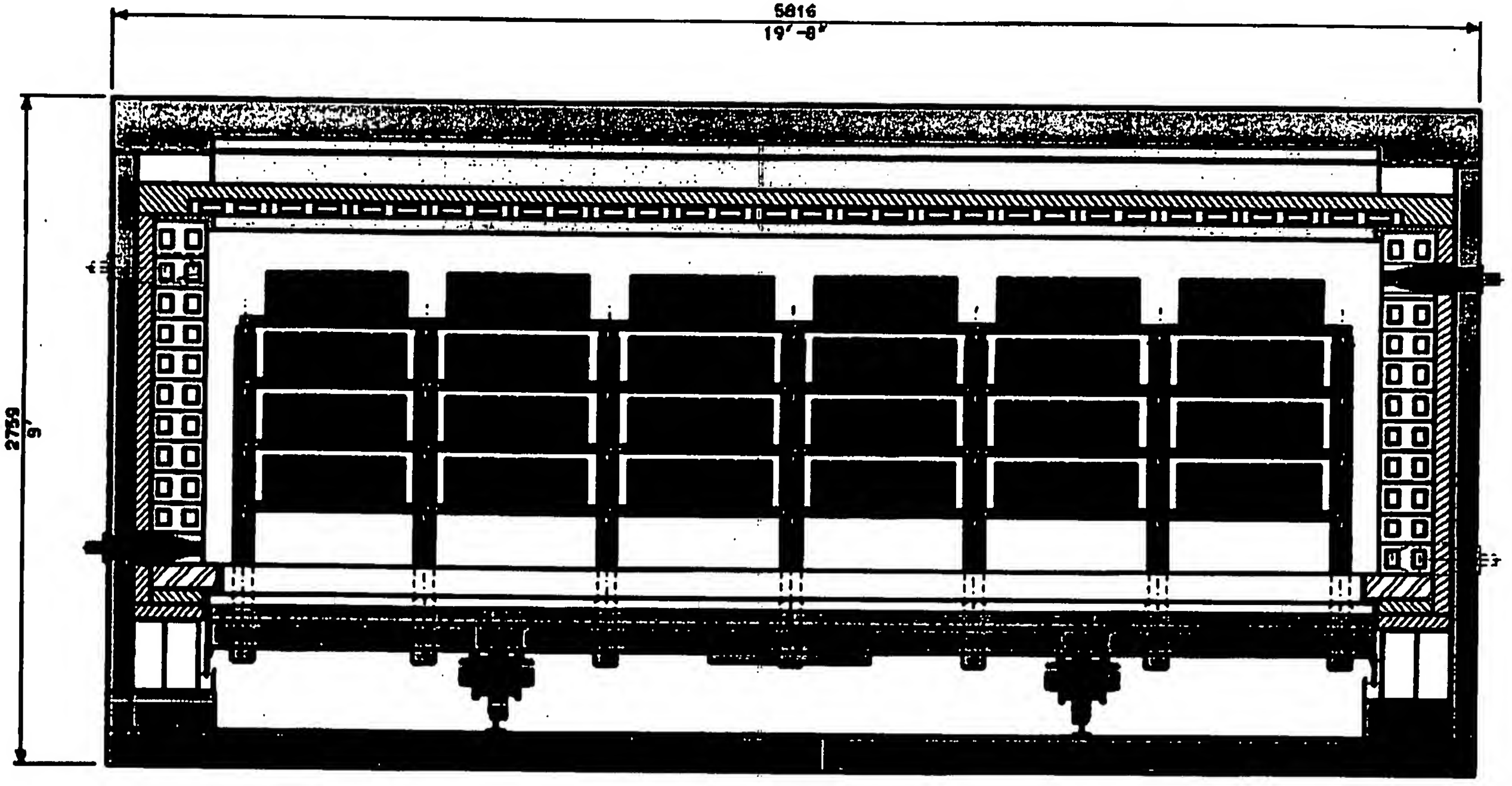
Silicon Carbide Support System



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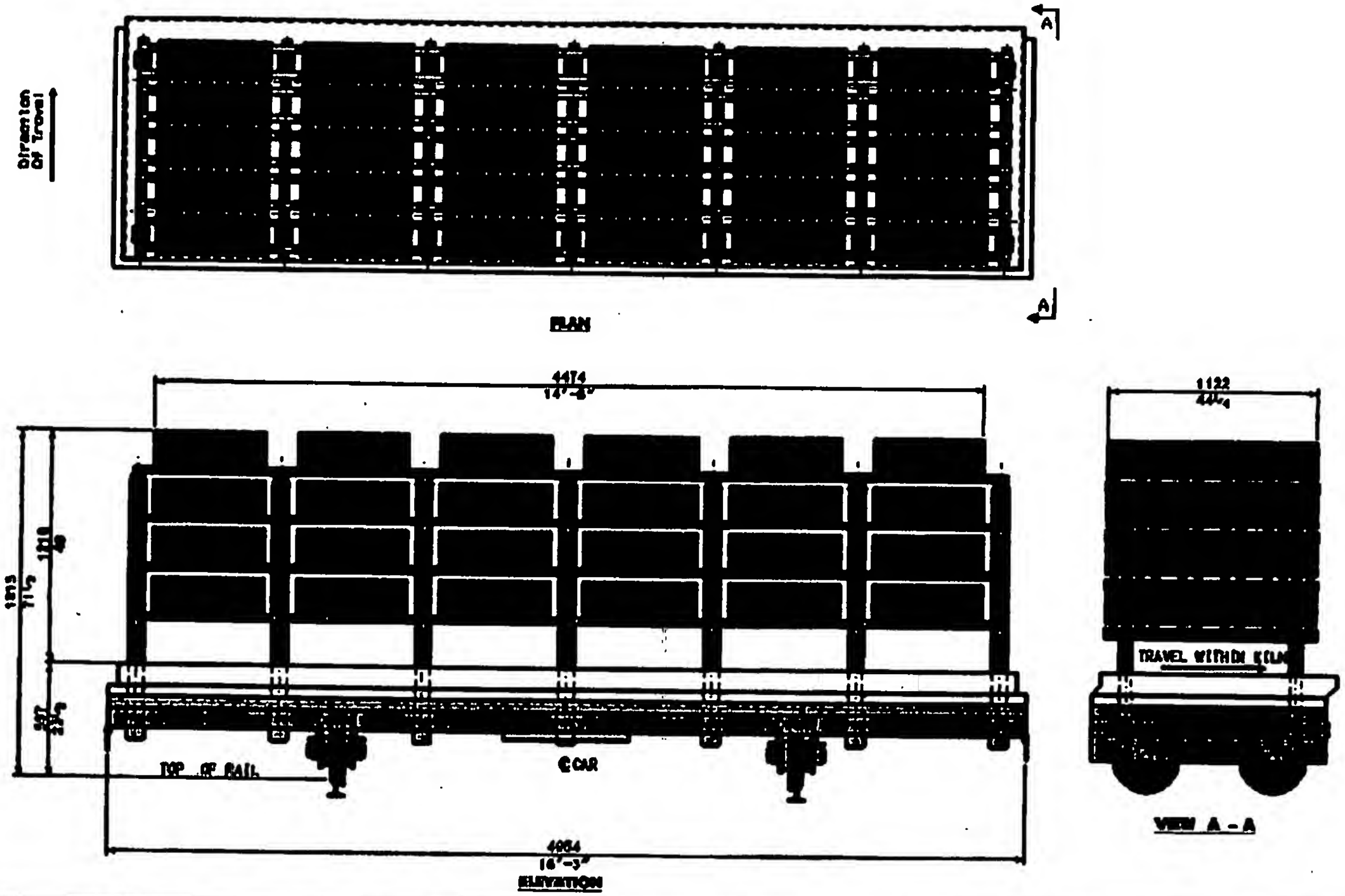
Kiln Car



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How to Build Kiln Cars

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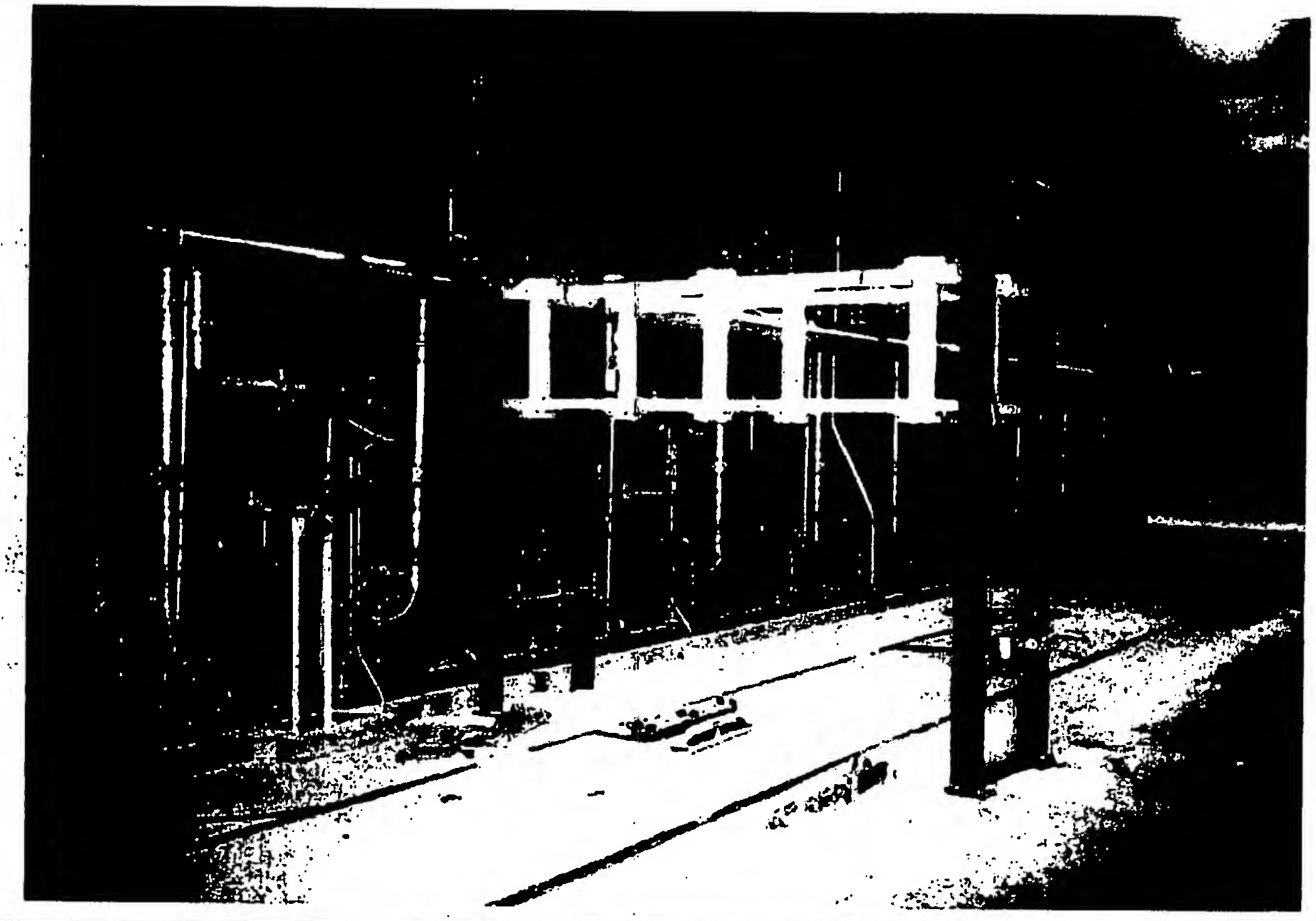

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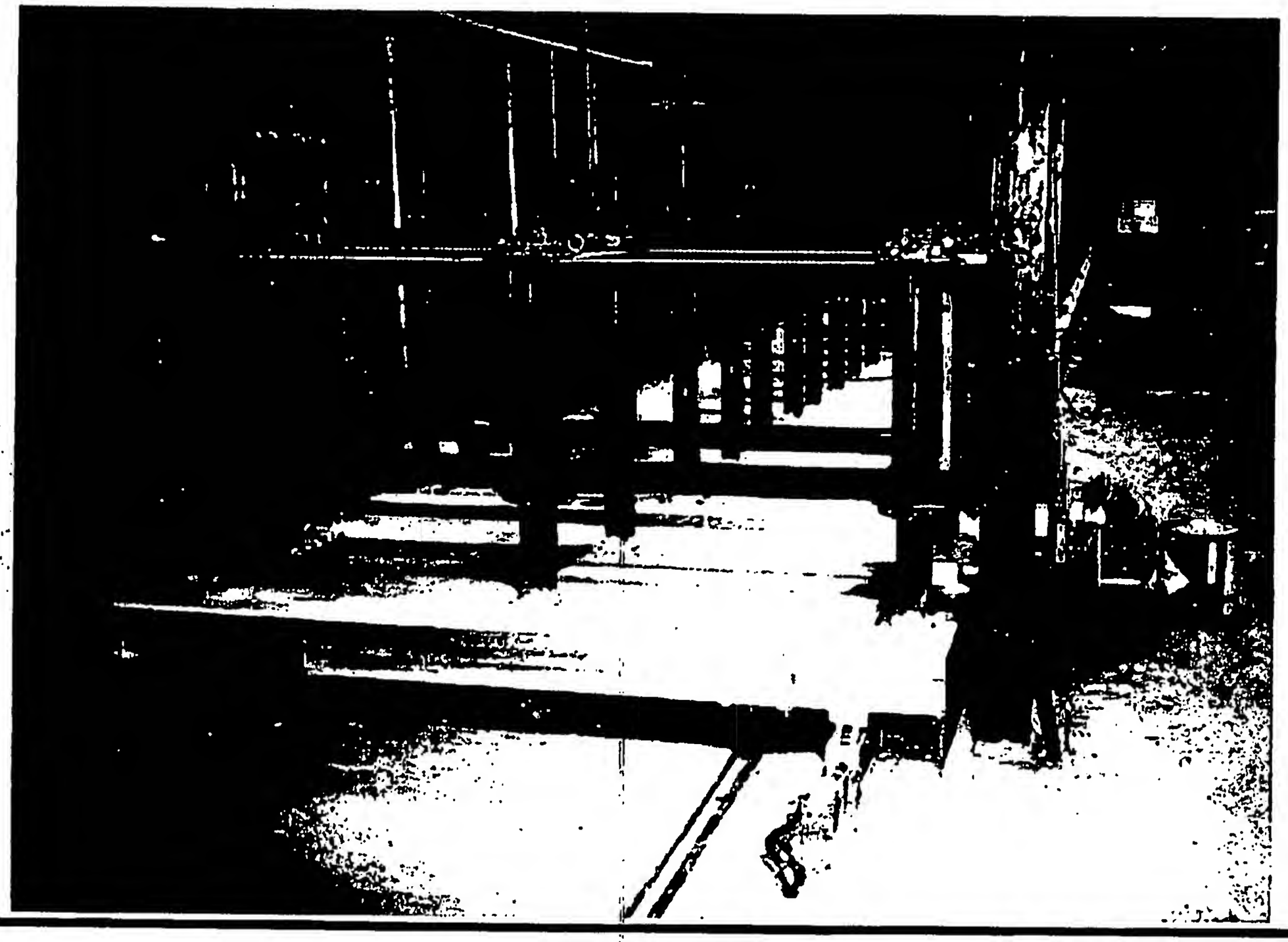

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How to Load Kiln Car

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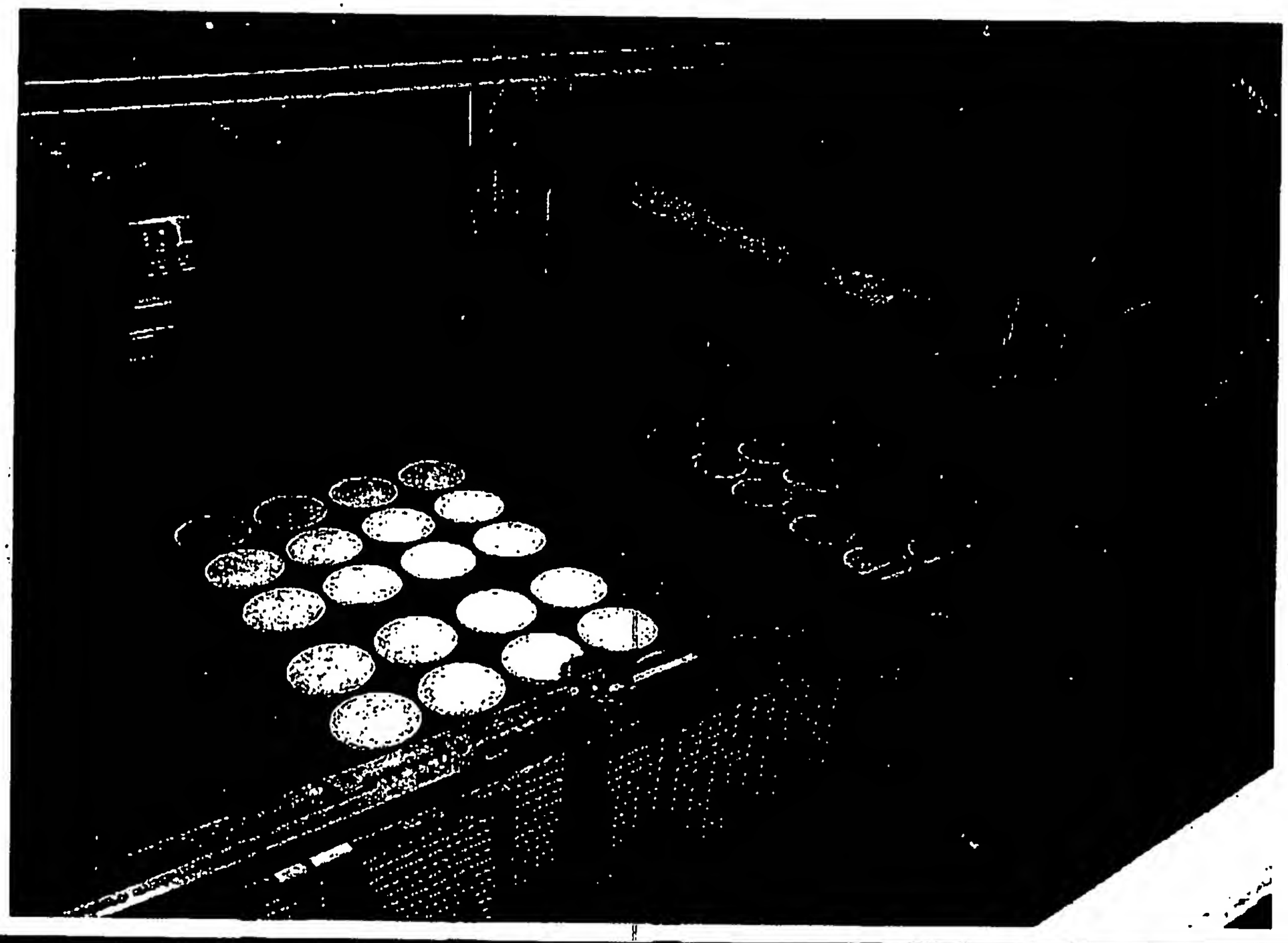

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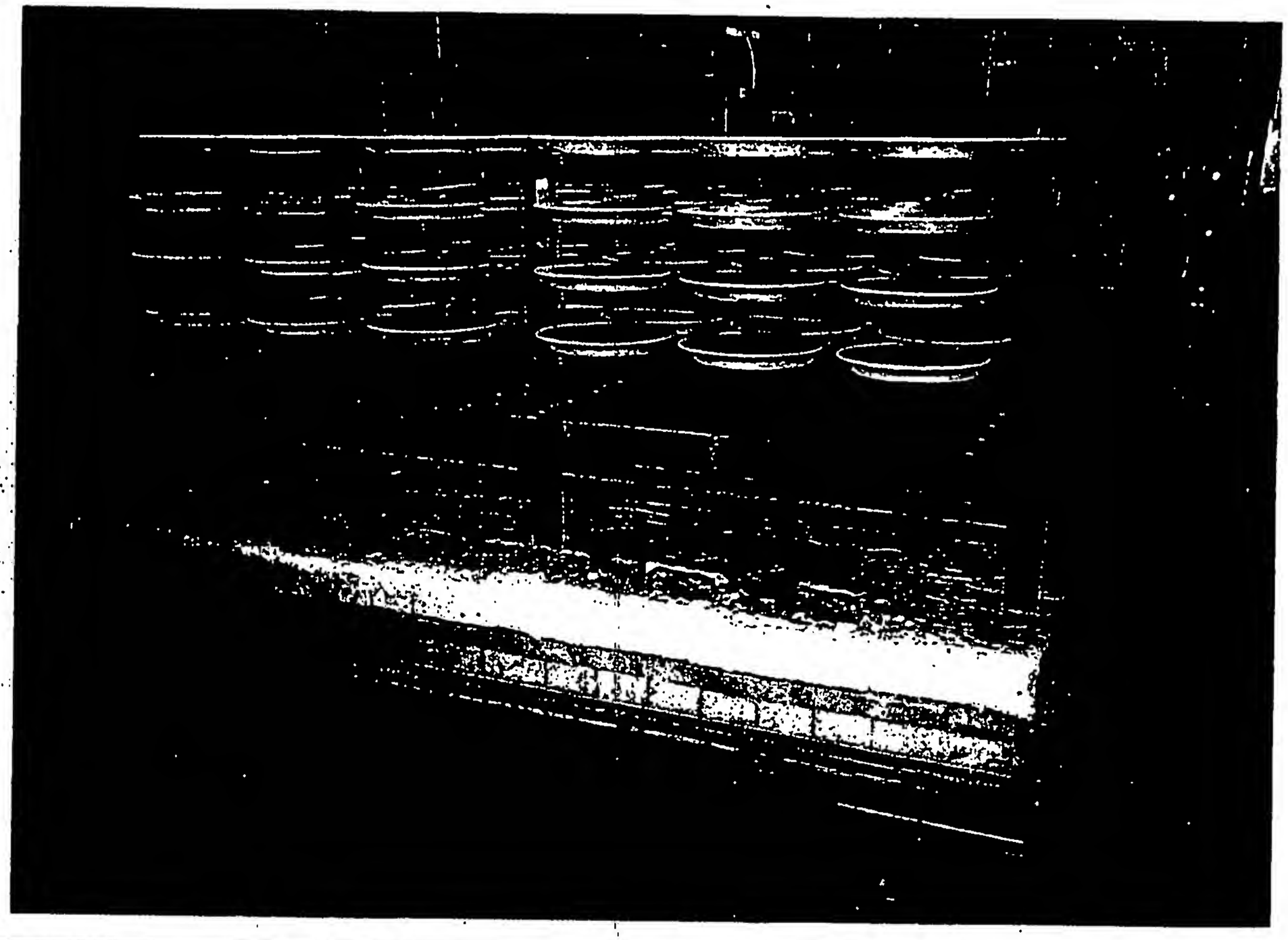

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Kiln Ware Support Structure

Si SiC posts and beams

- MOR - 37,000psi
- Completely impervious - zero porosity
- Silica glass protective coating on surface
- Use temperature limit 1350°C (2460°F)
- 10 year estimated useful life

Used for 10 years for light loads

Heavy Loads up to 2700 pounds per bay

Automated Load/Unload

- Loading Machine
  - 2-axis Servo Control
  - Laser positioning system
  - Bar code car ID
  - Data travels with kiln car
  - Loads up to 350 lbs

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How to Arrange Equipment

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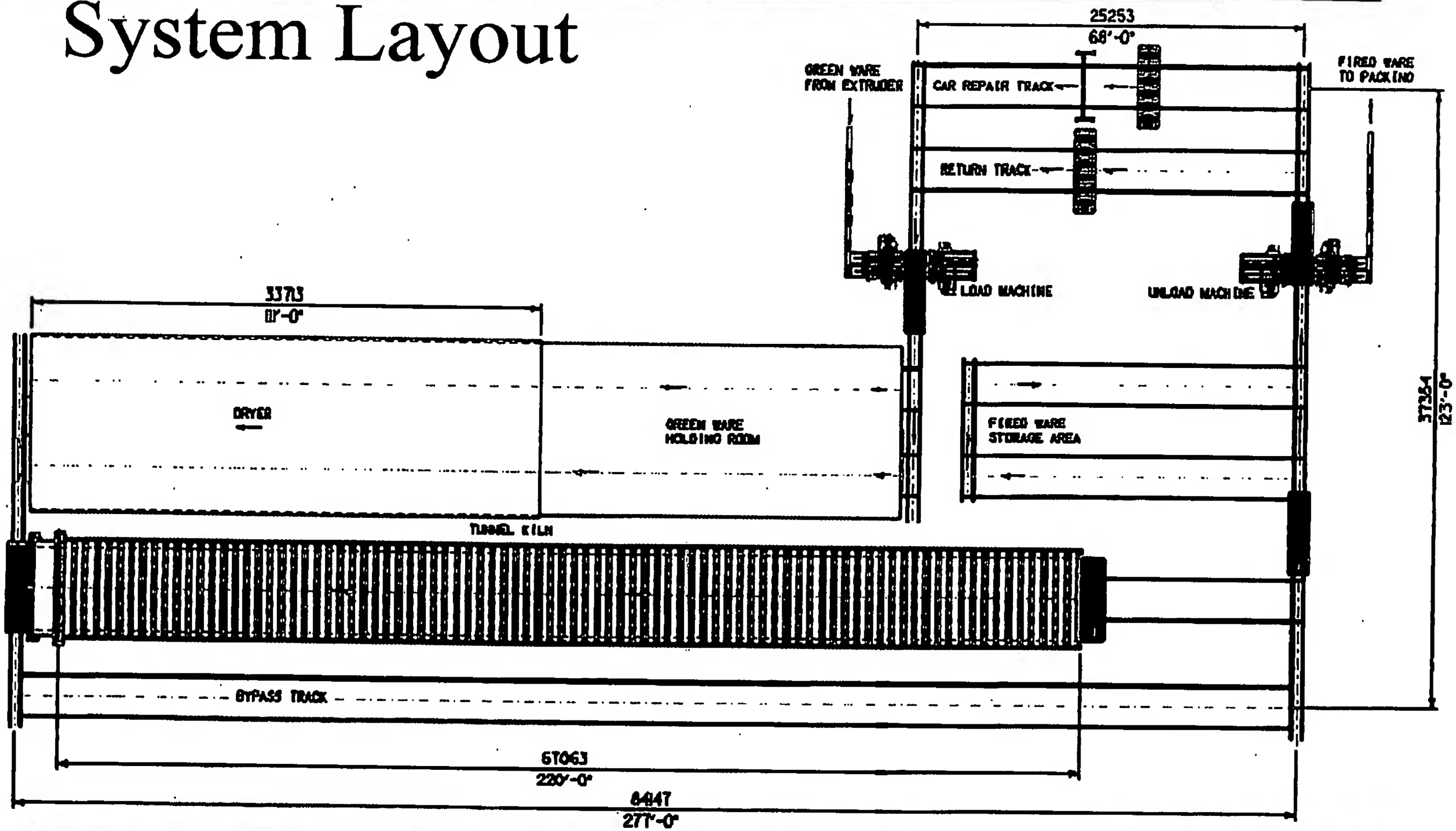
System Layout



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Production

- 70 Million Brick per Year
  200,000 brick per day for 350 days
  1920 brick per car
  - 6 bays wide per car
  - 320 brick per bay
  - 80 brick per level

4.34 kiln cars per hour

Load 10,000 brick per hour for 20 hours

Equipment Sizing

4.34 cars per hour

- 52 cars in kiln for 12 hour cycle
- Kiln length 220 feet
- 52 cars in dryer for 12 hour cycle
- Dryer Length 110 feet (2 cars wide)
- 35 cars for 8 hour storage

Kiln Car Loading

10,000 brick per hour

- 5.2 cars per hour
- 11.5 minutes to load car
- load 2 bays at time - index car 3 times
- 30 seconds to index car
- 1.5 minutes for 3 indexes
- 10 minutes for loading
- 12 cycles to load - 50 seconds per cycle

Benefits

- Faster Heating
  - Smaller Kiln
  - Smaller Dryer
  - Smaller Building
  - Reduced Capital Cost
  - Shorter Lead Time
  - Faster Feedback
  - Possible Lower Fluoride Emissions

Benefits

- Better Heat Exchange
  - Lower Fuel Consumption
- Better Temperature Uniformity
  - Size Control
  - Physical Properties
- No Pack Weight
  - Less Breakage
  - Better Size Control
  - No Kiln Marking
  - Less Defective Product Shipped

Benefits

- Lower Heat Storage
  - Ceramic Fiber Car Top
  - Silicon Carbide Kiln Furniture
  - Lower Fuel Consumption

Summary of Benefits

- Lower Capital Cost
- Minimize Labor Cost
- Improve Fuel Economy
- Higher Quality
- Reduce Scrap

Application Data Sheet

APPLICATION INFORMATION

Application Number::	
Filing Date::	September 26, 2003
Application Type::	Provisional
Subject Matter::	Utility
Suggested classification::	
Suggested Group Art Unit::	
CD-ROM or CD-R?::	None
Number of CD Disks::	
Number of Copies of CDs::	
Sequence Submission?::	
Computer Readable Form (CRF)?::	No
Number of Copies of CRF::	
Title::	SYSTEM AND METHOD FOR FIRING BRICKS
Attorney Docket Number::	P2037PRO
Request for Early Publication?::	No
Request for Non-Publication?::	No
Suggested Drawing Figure::	
Total Drawing Sheets::	23
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Latin Name::	
Variety denomination name::	
Petition Included?::	No
Petition Type::	
Licensed US Govt. Agency::	
Contract or Grant Numbers::	
Secrecy Order in Parent Appl.?::	No

APPLICANT INFORMATION

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	J.
Middle Name::	Russell
Family Name::	Woodside
City of Residence::	Crystal Lake
State or Prov. of Residence::	Illinois
Country of Residence::	US
Street of mailing address::	1564 Magnolia Drive
City of mailing address::	Crystal Lake
State or Province of mailing address::	Illinois
Country of mailing address::	US
Postal or Zip Code of mailing address::	60014

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Ryan
Middle Name::	F.
Family Name::	Washburn
City of Residence::	Crystal Lake
State or Prov. of Residence::	Illinois
Country of Residence::	US
Street of mailing address::	961 North Shore Drive
City of mailing address::	Crystal Lake
State or Province of mailing address::	Illinois
Country of mailing address::	US
Postal or Zip Code of mailing address::	60014

CORRESPONDENCE INFORMATION

Correspondence Customer Number::	08968
Phone:	312-569-1000
Fax:	312-569-3000
E-mail Address:	ipdocket@gcd.com

REPRESENTATIVE INFORMATION

Representative Customer Number:	08968

Representative Designation:	Registration Number:	Representative Name:

DOMESTIC PRIORITY INFORMATION

Application:	Continuity Type:	Parent Application:	Parent Filing Date:

FOREIGN APPLICATION INFORMATION

Country:	Application Number:	Filing Date:	Priority Claimed

ASSIGNEE INFORMATION

Assignee name::	Eisenmann Corporation
Street of mailing address::	150 East Dartmoor Drive
City of mailing address::	Crystal Lake
State or Province of mailing address::	Illinois
Country of mailing address::	US
Postal or Zip Code of mailing address::	60014

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